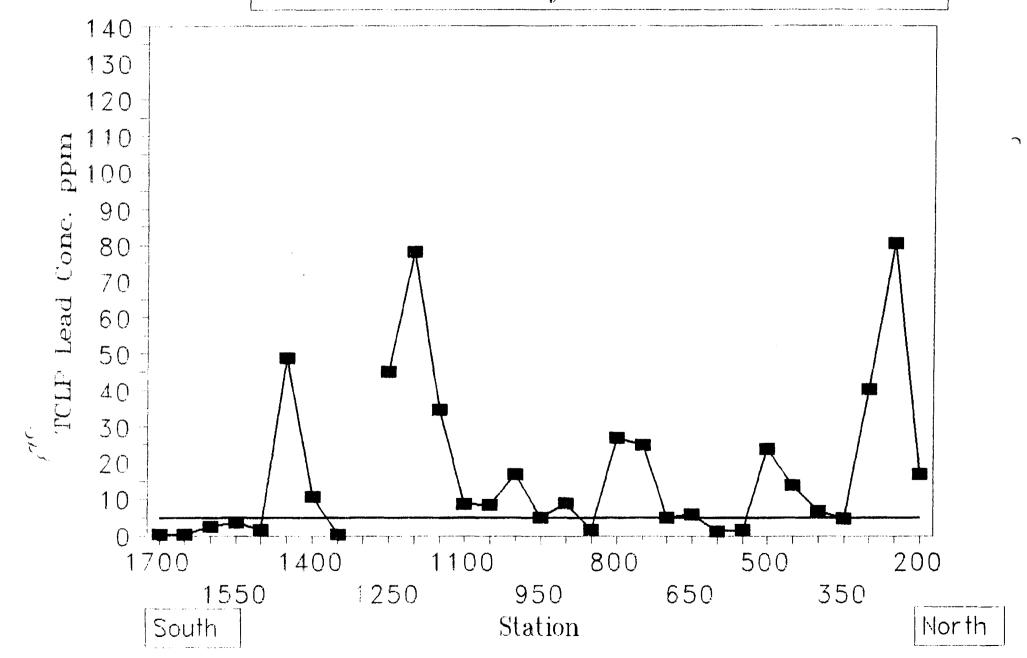
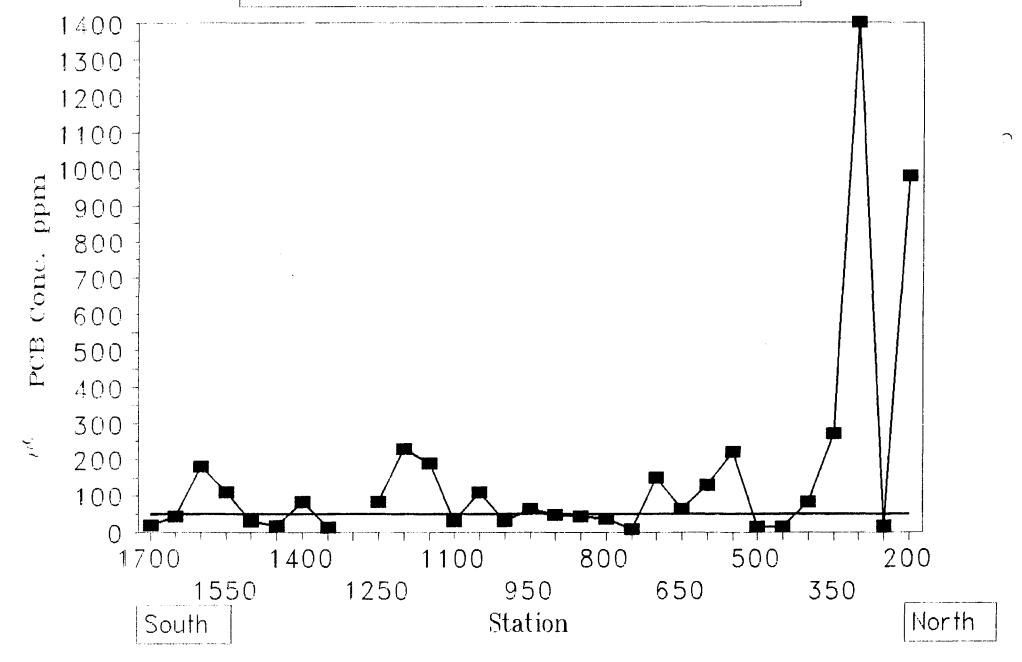


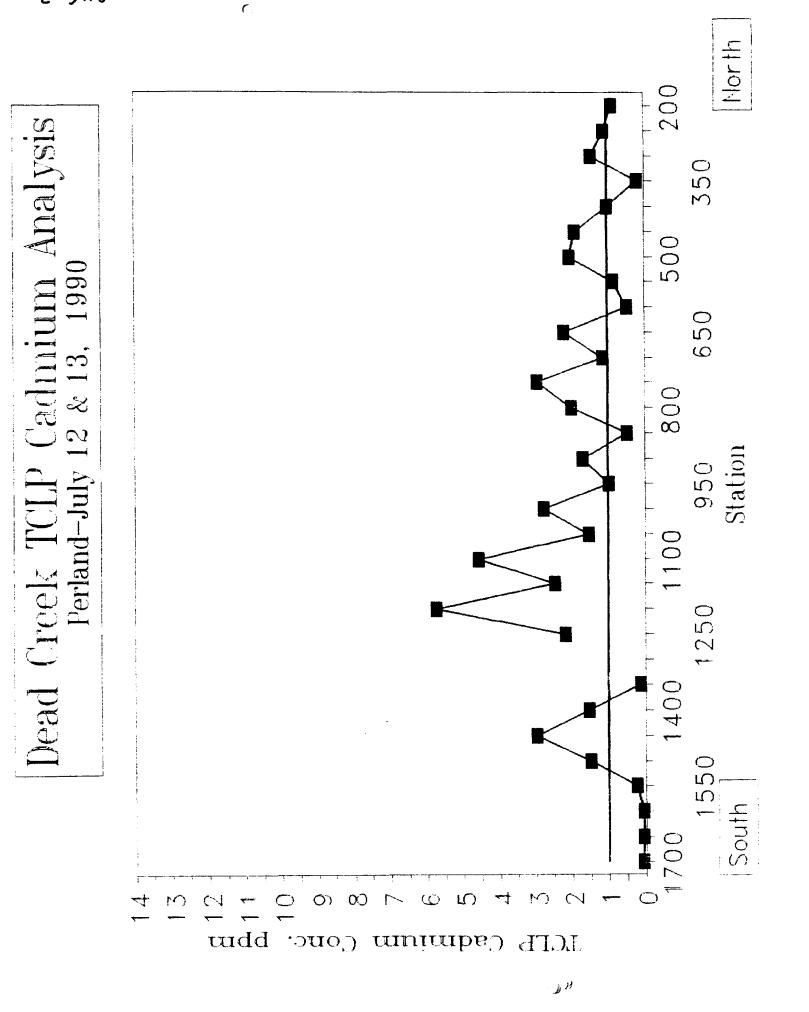
PO: <u>92262</u>	CHAIN OF CUSTODY - SO RO COPPER PRODUCTS - SAU	LID WASTE	
CERR	RO COPPER PRODUCTS- SAU	GET, ILLINOIS	56559
SAMPLE NAME: DEOC CO	eek Jediment	SAMPLE I.D. #:	1 56
SAMPLING DATE: 8/3/90		SAMPLER'S INIT	
4	SAMPLE TRANSPORTA		1
SAMPLE CARRIER: Jom_	John (sign)	DATE: <u>8/3</u>	FIG TIME:
SAMPLES REC'D : By Lab	(sign)	DATE:	TIME:
	LABORATORY WOR	<u> </u>	
LABORATORY: Environ	netur	PHONE:	
ADDRE22:		CONTACT:	
XTCLP METALS (\$)Pb*C	$\sqrt{\chi}$ paint filter tes	ST	Phenol
TCLP ORGANICS (25)	IGNITABILITY (<1	140F)	TOC
TCLP PESTICIDES(4)	CORROSIVITY (pH	OF 10% SOLN.)	TOX or EOX
TCLP HERBICIDES(2)	REACTIVITY (CN 8	k Sulfide)	Cr+6
Arsenic (T)	Total Solids (%)	)	XPCB (TOTO
Barium (T)	Mercury (T)	X	EP PheC
Cadmium (T)	Nickel (T)		
Chromium (T)	Selenium (T)		
Copper (T)	Silver (T)		
Lead (T)	Zinc (T)		
Comments: 1. ALL ANALYS	IS TO BE PERFORMED I	IN ACCORDANCE W	IITH SW846
Analysis Requested by:	Julana		
Problems or Question Plane Cerro Copper: Joseph Gra			
Copy Distribution of Cha Goldenrod:Sampler's Copy	ain-of-Custody	r leaves & Com	o ofter signing
Yellow:Lab's Copy	y Pink:Transporter White:Lab return		

## Dead Creek TCLP Lead Analysis Perland-July 12 & 13, 1990



## Dead Creek PCB Analysis Perland-July 12 & 13, 1990





XC: RA

To: Joe Grana

From: Kevin McGown

Date: August 7, 1990

Subject: EP-TOH metals data results:

<u>Sation</u>	<u>Codmium(PPM)</u>	Lead(PPM)
14+50	1.950	18.500
12+00	2.140	14.500
7+50	1.230	2.210
3+00	.470	.916
2+50	.490	4.060

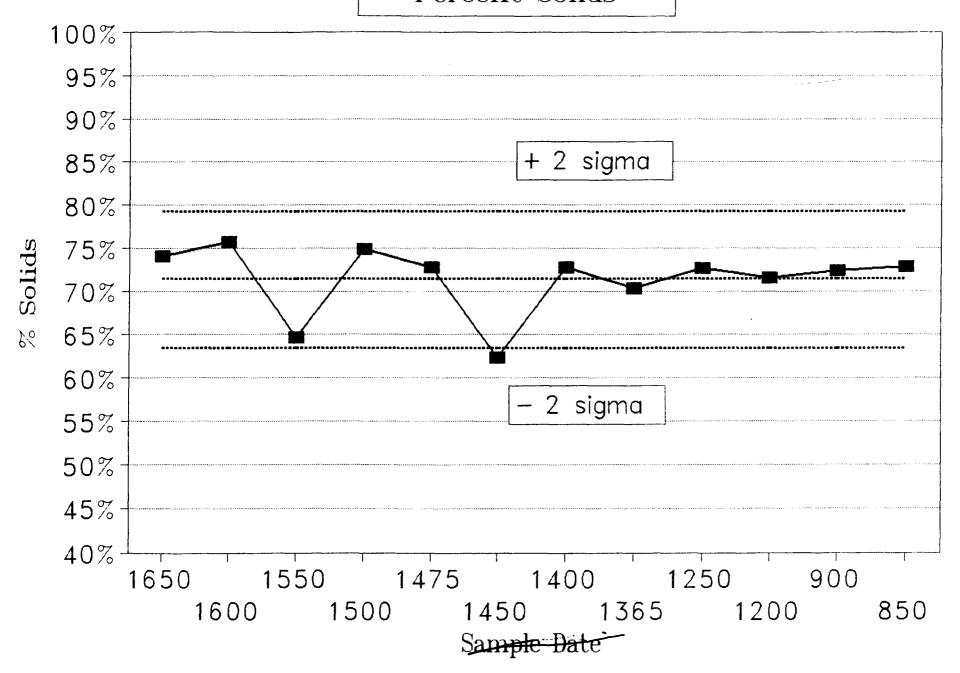
## Comparison of EP-TOH and TCLP metals

	EP-TOH	EP-TOH	TCLP meta	ils(PPM)
<u>Station</u>	Cadmium(PPM)	Lead(PPM)	<u>Cadmium</u>	Lead
14+50	1.950	18.500	2.970	48.700
12+00	2.140	14.500	5.740	77.900
7+50	1.230	2.210	2.940	24.800
3+00	.470	.916	1.150	28.300
2+50	.490	4.060	1.100	80.500 —

CERRO COPPER SEDIMENT SAMPLING - JULY

STATION	FEET FROM	SAMPLE	(milligrams,	/liter)	
	TRACK CL	HUMBER	Mercury	Setenium	Silver
			0.2	1 -	5
17+00	97	CSA2-90-0025-01	0.0002*	0.003*	0.002*
16+50	108	CSA2-SD-0075-01	0.0002*	0.003*	0.002*
16+00	93	CSA2-SD-0125-01	0.0002*	6.015*	0.002*
15+50	98	CSA2-SD-0175-01	0.0002*	0.030*	0.002*
15+50	<del>9</del> 8	CSA2-SD-0175-01	0.0002*	0.030*	0.002*
15+50	98	CSA2-SD-0175-01	0.0002*	0.030*	0.002*
15+00	98	CSA2-50-0225-01	0.0002*	0.015*	0.002*
14+50	95	CSA2-SD-0275-01	0.0002*	0.030*	0.002*
14+00	88	CSA2-SD-0325-01	0.0002*	0.030*	0.002*
•					
13+50	89	CSA1-SD-0025-01	0.0002*	0.015*	0.002*
12+50	76	CSA1-SD-0075-01	0.0002*	0.030*	0.002*
12+00	75	CSA1-SD-0125-01	0.0002*	0.030*	0.002*
11+50	66	CSA1-SD-0175-01	0.0002*	0.030*	0.002*
11+00	69	CSA1-SD-0225-01	8.0002*	0.030*	0.002*
10+50	77	C\$A1-\$0-0275-01	0.0002*	0.030*	0.002*
10+00	72	CSA1-SD-0325-01	0.0002*	0.030*	0.002*
9+50	80	CSA1-80-0375-01	0.0002*	0.030*	0.002*
9+00	82	CSA1-SD-0425-01	0.0002*	0.003*	0.002*
8+50	72	CSA1-SD-0475-01	0.0002*	0.030*	0.002*
8+00	73	CSA1-SD-0525-01	0.0002*	0.003*	0.002*
8+00	73	CSA1-SD-0525-01	0.0002*	0.006*	0.002*
8+00	73	CSA1-SD-0525-01	0.0002*	0.003*	0.002*
7+50	75	CSA1-SD-0575-01	0.0002*	0.003*	0.002*
7+00	85	CSA1-SD-0625-01	0.0002*	0.003*	0.002*
6+50	90	CSA1-50-0675-01	0.0002*	0.015*	0.002*
6+00	98	CSA1-SD-0725-01	0.0002*	0.006*	0.002*
5+50	102	CSA1-SD-0725-01	0.0002*	0.030*	0.002*
5+00	108	CSA1-90-0825-01	0.0002*	0.030*	0.002*
4+50	113	CSA1-50-0875-01	0.0002*	0.015*	0.002*
4+00	112	CSA1-SD-0925-01	0.0002*	0.030*	0.002*
3+50	120	CSA1-SD-0975-01	0.0002*	0.015*	0.002*
3+00	124	CSA1-SD-1025-01	0.0002*	0.030*	0.002*
3+00	124	CSA1-SD-1025-01	0.00024	0.030*	0.002*
3+00	124	CSA1-50-1025-01	0.0002*	0.030*	0.002*
2+50	129	CSA1-SD-1075-0		0.030*	0.002*
2+00	121	CSA1-SD-1125-01	0.0002*	0.015*	0.002*

## CAHOKIA SANDS Percent Solids



## VOLATILES DETERMINATION OF CAROXIA SANDS & CONTAMINATED SEDIMENT

[-[(G-F)/(F-C)]   PERCENT   VOLATILE	10.03\$	12.09%	39.44\$	52.53%	16.32%	11.53\$	10.25%	43,73%	12.82\$	64.14\$	71.22%	1.98%	1.32\$	3.74%	25.15%	1.74%	5,10%	2.04%	2,60%	11.81\$	1,83%	27.64%	27.19%	- <b></b>
(G-F) VOLATILE NEIGHT	6.37	5.60	4.56	6.29	9.90	4.22	6.92	5.16	6.53	4.83	3.71	11.89	10.43	10.56	8.99	9.61	8.74	11.04	9.35	10.38	10.73	9.87	9.02	
G YOLATILE DISH+SANPLE	25.68	23.42	23.20	25.35	24.65	22.52	24.33	22.74	23.36	23.61	21.92	31.33	28.36	27.45	27.55	28.00	27.02	29.36	27.57	27.60	28.13	26.22	27.36	
Hater	52.10%	54.98%	44.478		48.86%	68.56\$	47.26%	44.66%	51.05%			24.00%	22.96\$	31.61\$		25.57\$	32.53\$	25.27%	27.00%	15.63\$	26.64%			- <b>-</b> -
(F-C) DRY WEIGHT	7.08	6.37	7.53	1 1 1 1 1 1 1 1	7.17	4.77	1.71	9.17	7.49		i 1 1 1 1 1 1	12.13	10.57	10.97	• • • • • • • • • • • • • • • • • • •	9.78	9.21	11.27	9.60	11.71	10.93			
F DRY DISH+SAMPLE	 26.39	24.19	26.17		25.82	23.07	25.12	26.75	24.32			31.57	28.50	27.86		28.17	27.49	29.59	27.82	28.99	28.33			·
(D-C) WEIGHT	 14.78	14.15	13.56	13.25	14.02	15.17	14.62	16.57	15.30	13.47	12.89	15.96	13.72	16.04	12.01	13.14	13.65	15.08	13.15	13.95	14.90	13.64	12.43	
DISH+SAMPLE	 34.09	31.97	32.2	32.31	32.67	33.47	32.03	34.15	32.13	32.25	31.10	35.4	31.65	32.93	30.57	31.53	31.93	33.40	31.37	31.17	32.30	29.99	30.74	· <del></del>
DISH	19.31	17.82	18.64	19.06	18.65	18.3	17.41	17.58	16.83	18.78	18.21	19.44	17.93	16.89	18.56	18.39	18.28	18.32	18.22	17.22	17.4	16.35	18.31	
DATE  Station	 1646	1600	1550	1500	1475	1450	1400	1250	1200	906	820	1650	1600	1550	1500	1475	1450	1400	1365	1250	1200	006	820	
DATE	 												~ ~ ~											
i.b. #	56548	56552	56559	56564	56550	56546	56540	56542	56544	29595	26560	56549	56553	56558	56565	56551	56547	56541	56539	56543	56545	56563	56561	
SAMPLE	Sediment	Sediment	Sediment	Sediment	Sediment	Sediment	Sediment	Sediment	Sediment	Sediment	Sediment	Sands	Sands	Sands	Sands	Sands	Sands	Sands	Sands	Sands	Sands	Sands	Sands	
Dish #	 																							

		CAHOKIA	SANDS			•	DEAD CREEK	SEDIMENT	
	Percent	Percent	Percent	Percent	P	ercent	Percent	Percent	Percent
STATION	Moisture	Volatiles	Non-Solid	Solids	M	oisture	Volatiles	Non-Solid	Solids
1650	24.00%	1.98%	25.98%	74.02%		52.10%	10.03%	62.13%	37.87%
1600	22.96%	1.32%	24.28%	75.72%		54.98%	12.09%	67.07%	32.93%
1550	31.61%	3.74%	35.35%	64.65%		44.47%	39.44%	83.91%	16.09%
1500	0.00%	25.15%	25.15%	74.85%		0.00%	52.53%	52.53%	47.47%
1475	25.57%	1.74%	27.31%	72.69%		48.86%	16.32%	65.18%	34.82%
1450	32.53%	5.10%	37.63%	62.37%		68.56%	11.53%	80.09%	19.91%
1400	25.27%	2.04%	27.31%	72.69%		47.26%	10.25%	57.51%	42.49%
1365	27.00%	2.60%	29.60%	70.40%		44.66%	43.73%	88.39%	11.61%
1250	15.63%	11.81%	27.44%	72.56%		51.05%	12.82%	63.86%	36.14%
1200	26.64%	1.83%	28.47%	71.53%	-	0.00%	64.14%	64.14%	35.86%
900	0.00%	27.64%	27.64%	72.36%		0.00%	71.22%	71.22%	28.78%
850	0.00%	27.19%	27.19%	72.81%		24.00%	1.98%	25.98%	74.02%



PROJECT NO.	1	CT NAM						7	7		P	ARAI	METE	RS		INDUSTRIAL Y HYGIENE SAMPLE N
SAMPLERS: (Signate	Cerr	ه کمو	per	<u>-D</u>	ead Creek CS-A  (Printed)  Tim Pacini			SO /	_	<del> </del>	7	7			77	
We.	<b></b>				Tim Pacini			\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\	م م <sub>ين</sub>	<b>3</b> /	/ ,	/ ,	/	Ι,	/ /	REMARKS
FIELD SAMPLE NUMBER	DATE	TIME	COMP.	GRAB	STATION LOCATION	\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\	6/V			<del> </del>						
56564	7/3	<u> </u>		~	15+00	1	1									
56565	8\7			ㄴ	15+00	1		<b>V</b>							Elevation	on: 392,3
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	-		<del> </del>			<u> </u>										
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			<u> </u>						i							
Relinquished by: (Si	inted)  Date / Time Received by: (Signature)  8/1 0930  (Printed)  Printed)								y: (Si	gnature	,		Dat	e / Ti	me Rece	ived by: (Signature)
(Printed) Time they S. f.	Pecini		<u>,                                     </u>	15 1	(Printed)	(Pri	nted)	-							(Print	red)
Relinquished by: (Si			Date	e / Tin	Received for Laboratory by: (Signature)		Date	/ Tim	ne	Remar	ks		•		<u></u>	
(Printed)				_1	(Printed)											



PROJECT NO.	PROJE							1			P	ARA	METE	RS		INDUSTRIAL Y HYGIENE SAMPLE N
177	Cen	0 (c	pper	<u>- D</u>	pod Croek CS-A			8	<del>/</del>	7. 7	<del>, ,</del>	,	<del>, ,</del>	,	7 7	NOTE OF THE PARTY
SAMPLERS: (Signa	iture)			}	(Printed) Tim Porini			* / 4	/ الحديد الروا	<del>}</del> /					//	REMARKS
FIELD SAMPLE NUMBER	DATE	TIME	COMP.	GRAB	STATION LOCATION	/ §	5/0		3/	<del>}</del>						
5%564	H\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\			V	15+00	1	V									
56565	8\1			٧	15+00	1		V							Elevat.	on: 392.3
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		<u> </u>				_	<u> </u>								<u> </u>	
Relinquished by:	Signature)	_	Date $8/7$	/ Tim	· · ·	Reli	inguis	hed b	y: (Si	gnature	'n		Dat	te / T	ime Rece	ived by: (Signature)
(Printed)	inted)				(Printed)	(Pri	nted)								(Print	ted)
Relinquished by: (			Date	/ Tim	Received for Laboratory by: (Signature)		Date	/ Tin	ne	Rema	rks					
(Printed)					(Printed)											
						1			{}							

Distribution: Original Plus One Accompanies Shipment (white and yellow); Copy to Coordinator Field Files (pink).

## Versiling.

PROJECT NO.	,	ECT NAM							$\mathcal{T}$	$\mathcal{T}$		P	ARAN	NETE	RS			USTRIAL NE SAMPLE	Z <
# 111	CERT	20 COP	PER	<u> </u>	EMO CREEK	C5-A		_/	2/	$\leftarrow$	<u>4.7</u>	<del></del>	7	$\overline{}$	<del></del>	<del></del>	<del>/</del>		_0 <u>~</u>
SAMPLERS: (Signatu					(Printed)			1			3/					//			
125S	· Ka	<u></u>			Tim Peri	· A :	_/	/ § /	/ 37	/ ; !	/ /	/ ,	/ /	/ ,	/ /	/ /	RE	MARKS	
FIELD SAMPLE NUMBER	DATE	TIME	COMP.	GRAB	STATION	N LOCATION	8	5/1	S. J. Lee J. J. L.	ر مرازع									
56562	8/6	3 45		~	9+00		(	✓											
56563	8/6	3.45		~	9+00				1							Elevi	ation:	390.S	z′
Ø																			
																	<u> </u>		
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Relinquished by: (Si	grature)		Date	: / Tir	me Received by:	': (Signature)	Relin	ıquish	ed by	j: (Sig	nature	,		Dat	te / Ti	me Re	eceived by: (S	ignature)	
6501	<u></u>	8/	<b>6/x</b>	<u>ي (د</u>	40								_						
Relinquished by: (Single Printed)	Perin	,;			(Printed)		(Print	ied)								(Pr	rinted)		
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(Printed)					(Printed)				<del></del>										



PROJECT NO.		CT NAM								1		P	ARA	METE	RS		INDUSTRIAL Y HYGIENE SAMPLE IN
$g^{-}fe^{i}$	CERT	to Col	PPER	<u>_D</u>	EAD	CREEK CS-A		/	2	<u> </u>	<del>, , ,</del>	- ,	<del></del>	<del>,</del>	<del></del>	<del></del>	THE STATE OF THE S
SAMPLERS: (Signatu	re) . (2 :				(Prin	Tun Pecini					<i>}</i> /	/	/,			//	REMARKS
FIELD Sample Number	DATE	TIME	COMP.	GRAB		STATION LOCATION	Ş	5/0		3/ 3/ 3/							
56562	8/6	3. <b>45</b>		~		9+110	-	<b>\rangle</b>									
56563	3/6	3:45		V		9100	1		V							Elevan	tion: 390.52'
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Relinquished by: (Signature)	mature)	8	Date /6/90	7 Ti	ne りり	Received by: (Signature)	Reli	nquis	hed b	y: (Sig	nature	,		Dat	e / Ti	me Rece	ived by: (Signature)
Relinquished by: (Sie (Printed))	Perin	,				(Printed)	(Prin	ited)								(Print	ted)
Relinquished by: (Sig	gnature)		Date	e / Tie	ne	Received for Laboratory by: (Signature)		Date	/ Tim	ne i	Remar	ks					
(Printed)						(Printed)											
										$\bot$						<b>*•</b> .	

PROJECT NO.		CT NAM							7	7		Р	ARAN	AETE	RS		INDUSTRIAL Y HYGIENE SAMPLE
# ///	CEI	2720	OPP	ER.	- DEAD (	LREEK CS-A			2/	<i></i>	7,7	<del></del>	7			7	HYGIENE SAMPLE N
SAMPLERS: (Signatu			>		(Printed)						/ کی						
TimPerini	<u></u>	· A	<u> </u>	<u>S.</u>	Pain			\ <i>§</i>	جي/	\ or	"	/ ,	/ /	/ /	/ /		REMARKS
FIELD Sample Number	DATE	TIME	COMP	GRAB	STA	ATION LOCATION	ځ	SE COMP.	S.C. XX	Se Contraction of the Contractio		$\angle$					
56560	8/4/90	1:40		1	STATION	8+50											
56561	8/4/90	1:40		~	STATION	8+50/85 from B			V							ELEVAT	70N: 391.02'
ł						1 from 12											
			1														
			1														
			†-														
			1				<b> </b>										
	<b>†</b>		1	1			1										
			<del> </del>	<del>                                     </del>			-										
	<b> </b>	ļ	-														
Relinquished by: (Sig	nature)		Date	 	ne Receive	ed by: (Signature)	Reli	nquis	hed b	y: <i>(Si</i>	nature	<u> </u>		Date	/ Ti	me Rec	eived by: (Signature)
45.6	<u></u>	8/	4/90	1:4	0												
(Printed)			7		(Printed	)	(Prin	ited)								(Prir	ited)
Relinquished by: (Sig	gnature)		Date	e / Tir	ne Receive (Signatu	ed for Laboratory by: re)		Date	/ Tin	1e	Remai	ks				·	
(Printed)	<del></del>		<del> </del>		(Printed	)			1								



PROJECT NO.	PROJE					CREEK CS-A			7	7		Р	ARAN	NETE	RS		INDUSTRIAL Y HYGIENE SAMPLE
SAMPLERS: (Signatu	ure)				(Printed)			10 00 VS	S INERS	\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\	\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\	$\overline{Z}$	7	7		7/	REMARKS
FIELD Sample Number	DATE	TIME	97.	GRAB		TATION LOCATION	1	8 / W	1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1	1.00 × 50 × 50 × 50 × 50 × 50 × 50 × 50 ×							
56560	8/4/90	1:40		1	STATIO	~ 8150		V									
56561	0/4/90	1:40		V	STATION	8+50/85'			V							ELEVA	TION: 391.02'
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Relinquished by: (Signature)	mature)	B	Date 3/4/90	e / Tin	- 1	ived by: (Signature)	Reli	inquis	hed by	y: (Sig	gnature	j		Date	e / T	ime Rec	ceived by: (Signature)
(Printed)						ted)	(Prin	nted)						<del></del> -		(Prin	nted)
Relinquished by: (Sig	gnature)		Date	e / Tir	me Recei	ived for Laboratory by:  ature)		Date	/ Tim	16	Remar	riks					
(Printed)				_ <b></b>	(Printe	ed)			<u> </u>								

## Versarine.

PROJECT NO.	PROJE	CT NA	ME	$\sim$					7	7		P/	ARAN	AETE	RS			INDUSTRIAL HYGIENE SAMPLI	Y
SAMPLERS: (Signatu	ye) You		RFO	Co	PRER (Printed) KEVIN M	(Jowa)		Jan San San San San San San San San San S	Sugar Contraction of the same	N. S.	1	/	7	7	7	//	/	REMARKS	
FIELD SAMPLE NUMBER	DATE	TIME	8	GRAB	STAT	ION LOCATION	Ž		2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2										
56558	8/4/90	1030		1	5M 154	150 center										EVE	<b>v</b> . (	391.85	
56559	Ť	1030		V	50A 15	450 corner		$\checkmark$								 			
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PROJECT NO.	PROJE	CT NA		-				7	7		P	ARA	METI	ERS			INDUSTRIAL HYGIENE SAMPLE	Y
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FIELD SAMPLE NUMBER	DATE	TIME	COMP	GRAB		STATION LOCATION	8	6/4	\\ \\ \\ \\ \\ \\ \\ \\ \\ \\ \\ \\ \\	7							
56552		10:40	<u> </u>	~	1	6+00/80.0'from B		~								Elevati	10h : 393.75
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PROJECT NO.	PROJE	CT NA	AME				· · · · ·	$\mathcal{T}$	7		P	ARAI	NETE	R\$	<del></del>	INDUSTRIAL Y HYGIENE SAMPLE
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Muchala	M.	n	<u>~</u>	·	PER DEAD CREEK-C. (Printed) Michael Grasso			3	100	<b>'</b> //	/ ,	/ ,	/ ,	/ /	/ /	REMARKS
FIELD SAMPLE NUMBER	DATE	TiMi	نما	GRAB	STATION LOCATION	\\ \{ \}	6/6	S. T. S. L. Wers								
56550	8/2/40	N 20		/	14+75	1	~								393.	8EL-95'B
26221	3/2/20	420		-	14 + 75	1									1	
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PROJECT NO.	1	CT NAM		$\bigcirc$	PPER			/	Z		Р	ARA	METI	ERS		INDUSTRIAL HYGIENE SAMPI	E N
SAMPLERS: (Signate	<u></u>	· · · · · · · · · · · · · · · · · · ·			(Printed) Michael Grasso		S. Com.			re /						REMARKS	
FIELD SAMPLE NUMBER	DATE	TIME	COMP.	GRAB	STATION LOCATION	Ž	4/3	6	5 / 5								
56548	8/1/10	17 00		-	16+4660 STAKE	(	-										
56549	K	1		-	16+46 60 STAKE	(		1								395.765	ELEV.
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PROJECT NO.	PROJE	CT NAM	IE	PPEN	DEAD GREEK			/ "	Z		Р	ARAI	METE	RS		INDUSTRIAL Y HYGIENE SAMPLE N
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FIELD SAMPLE NUMBER	DATE	TIME	COMP.	GRAB	STATION LOCATION	/\$	5/V	3/63 6/63								
56546	8/1	11:45		V	14+50\5. Creek	1	/								ELEVAT	non = 393.421
56547	8/1	11:45		V	14+50\5.Creek 14+50\S.Creak	1		<b>V</b>							ELEVAT	nor = 393.42'
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SAMPLERS: (Signatu	re)				(Printed)			// نخج	. /	/زمي									
Ruchel	K.	سب	-		(Printed)  Michael Grass.		\ <i>\</i> \$	/k <sup>3</sup>		"	/ ,	/ ,	/ .	/ /	/ /	RE	MARKS	•	
FIELD Sample Number	.DATE	TIME	COMP	GRAB	STATION LOCATION	Ž	2/2/2	SINGE TIMERS	6 5kg/										
56544	7/31/40	1200	J	~	12+00/42'OFF B		~								SAMPLE	TAKEN	@3	95.6	,′
56545	1.1	1500		~	12+00\42' off B			<b>1</b>							"	"	"	"	
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M.choel C	PLASS	u				<b> </b>						$\bot$							
Relinquished by: (Sig	gnature)		Date	e / Tir	ne   Received for Laboratory by: (Signature)		Date	/ Tin	ne	Remai <	ks C	inn	.0	Cat	6				
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FIELD SAMPLE NUMBER	DATE	TIME		GRAB		TION LOCATION	\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\	8/3	2/3/3											-
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501 42	<u> </u>	<b></b>		<u>                                     </u>	15.62	40 43.739 V	4/	1		Te	\$72	1	Z	13,	<u> </u>	<b> </b>				
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Distribution: Original Plus One Accompanies Shipment (white and yellow); Copy to Coordinator Field Files (pink).

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PROJECT NO.	1	CT NAM						7	7		Р	ARA	METE	ERS		INDUSTRIAL HYGIENE SAMPLE	Y
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FIELD SAMPLE NUMBER	DATE	TIME	COMP.	GRAB	STATION LOCATION	/ §	See Cours	SEON SE								Vo/'s	
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## VOLATILES DETERMINATION OF CAHOKIA SANDS & CONTAMINATED SEDIMENT

Dish #¦	SAMPLE	I.D. #	' NATE	! ! !	C	D WET ; DISH+SAMPLE ;	(D-C) WET	DRY	(F-C)	*	VOLATILE	VOLATILE	1-[(G-F)/(F-C)] PERCENT VOLATILE
, U 1311   R   } :		, 1.V. #		+	0130	OTOH ON REF	METONI	DISH	MLIUII	; +		)	
BANK	Sands	· · · · · · ·	i +	; ; ;		 		 		i +	i 	} +	
		<u> </u>	+	+		31,10		! ! <b>!</b>	:   	   	21.92	   	! ! <del> </del>
BLUX	Sands	6.1	8/4	850	18.31	30,74		(   	   	1   	27.36	   	[ 
F	Sediment	62	8/8	1900	18.78	32.25		·	! ! !	!	23,61	! !	! !
E	Sands	43	816	900	1635	29,99		! !	† 	!	26.22		, !
G	Sediment	64	8/7	1500	19,06	32.31	,   	†	1	†   	25,35	1	1
1	Sands	65	18/7	1500	18.56	30.57	· · · · · · · · · · · · · · · · · · ·	†   	† ! !	+	27.55	+	   
†	Sediment-rerun	† i 1	<del> </del> 	†		 		† ! !	† ! !	†~~~~~   	† i !	†   	† i 1
† !	Sands-rerun	†   	+ !		<del> </del>	†	 	<del> </del>	† ! !	† [	† ! !	+ ! i	†
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# VOLATILES DETERMINATION OF CAROKIA SANDS & CONTANINATED SEDIMENT

 			+	*	+		+	Sanda	Sediment	Samia	Sedimenti	Sanda	<u>\$</u>	Sarran		\ 	Sediment 56542 731 17,58 34,15	Sands	Sediment	Sanda	Sedement	Sanas	SAMPLE
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												<i>¥</i> 31	7/3।	17/31	7/31	43 7/31	2/3/	7/27	7/27	7/26	7/23	7/23	DATE
f 1 1 1 1 1			 			! ! ! ! !	; ; ; ; ; ; ;				1 1 1 1 1 1 1					72231.17	17,58	18.32	17,41	18,22	19.07	18.53	DISH
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						) ) 0 1 1 1										13.96	16,5)	15.08	14.62	13, 15	16.78	6	(D-C) WEI WEIGHT
																139628.99 11.77 157 27.60	16.5, 26, 75, 9,17, 44,7, 22.74	15.08 29.5911.27 25.3 29.36	14.6225.12 7.71 473 24.33	$\mathcal{O}$	3	32./3	F (F-C) DRY DRY DISH+SAMPLE WEIGHT
																11.77	9,17	11. 27	27/	ì	13.14	13.60	(F-C) DRY HEIGHT
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																	12.74	29,36		,	12.14 21.7 23.65	13.60 14.3 30,45	VOLATILE DISH+SAMPLE
	3							 								10.38	5.16	11.04	692	9.35	4.57	11.92	(G-F) WEIGHT WEIGHT
	1																	840.8	10.25%	97. 87	65,1%	12,3%	1-[(G-P)/(F-C)] E PERCENT VOLATILE

## ENVIRONMETRICS



2345 Millpark Drive Maryland Heights, MO 63043 (314) 427-0550

August 1990

Dear Sir or Madam:

This letter is to inform you that I am no longer with Envirodyne/TCT, and have joined Environmetrics, Inc. as Vice President in charge of Business Development. I am excited about this move and look forward to continuing our past relationship and working with you and your company in the near future.

Environmetrics is a privately-held independent laboratory that was established in 1978 and is engaged in environmental analysis, oil testing and R&D projects for various clients. Due to the rapid growth of the company, Environmetrics moved last year into a new 23,000 square foot state-of-the-art laboratory.

This expansion has positioned Environmetrics to become one of the most efficient environmental laboratories in the Midwest. Normal sample turn-around is 1-2 weeks, while our FASTRAK service provides 72 hour turnaround for priority pollutants, volatiles, and BNA's.

Environmetrics will expand its capabilities and services in the future so don't hesitate to discuss your needs with me at anytime. Our toll-free number is 1-800-333-3278. When you are in St. Louis, I would be pleased to give you a tour of our new laboratory and discuss your needs with our staff.

Sincerely yours,

ENVIRONMETRICS, INC.

Shaaban Ben-Poorat Vice President

Business Development

SP/kjv

Enclosure

SOLIDS/Total. Fixed, & Volatile

99

mL/L. Where a separation of scittleable and floating materials occurs, do not estimate the floating material as settleable matter.

- b. Gravimetric:
- 1) Determine total suspended solids of well-mixed sample (Section 209C).
- 2) Pour a well-mixed sample into a glass vessel of not less than 9 om diam using not less than 1 L and sufficient to give a depth of 20 om. Alternatively use a glass vessel of greater diameter and a larger volume of sample. Let stand quiescent for 1 h and, without disturbing the settled or floating material, siphon 250 mL from center of container at a point halfway between the

surface of the settled material and the liquid surface. Determine total suspended solids (milligrams per liter) of this supernatant liquor (Section 209C). These are the nonsettleable solids.

## 4. Calculation

mg settleable solids/L

- mg total suspended solids/L
  - mg nonsettleable solids/L

## 5. Precision and Accuracy

Precision and accuracy data are not now available.

## 209 F. Total, Fixed, and Volatile Solids in Solid and Semisolid Samples

## 1. General Discussion

a. Applicability: This method is applicable to the determination of total solids and its fixed and volatile fractions in such solid and semisolid samples as river and lake sediments, aludges separated from water and wastewater treatment processes, and sludge eakes from vacuum filtration, centrifugation, or other sludge dewatering processes.

b. Interference: The determination of both total and volatile solids in these materials is subject to negative error due to loss of ammonium carbonate and volatile organic matter during drying. Although this is true also for wastewater, the effect tends to be more pronounced with sediments, and especially with sludges and sludge cakes. The mass of organic matter recovered from sludge and sediment requires a longer ignition time than that specified for wastewaters, effluents, or polluted waters. Carefully observe specified ignition time and temperature to control losses of

volatile inorganic salts. Make all weighings quickly because wet samples tend to loss weight by evaporation. After drying or ignition, residues often are very hygroscopic and rapidly absorb moisture from the air.

## 2. Apparatus

All the apparatus listed in Section 209A.2 is required except that a balance capable of weighing to 10 mg may be used.

## 3. Procedure

- a. Total solids:
- 1) Preparation of evaporating dish—If volatile solids are to be measured, ignite a clean evaporating dish at 550 ± 50°C for 1 h in a muffle furnace. If only total solids are to be measured, heat dish at 103 to 105°C for 1 h in an oven. Cool in desiceator, weigh, and store in desiceator until ready for use.
  - 2) Sample analysis
- waters. Carefully observe specified ignition a) Fluid samples—If the sample contains time and temperature to control losses of enough moisture to flow more or less read-

P. 82

100

## PHYSICAL EXAMINATION (200)

ily, stir to homogenize, place 25 to 50 g in a prepared evaporating dish, and weigh. Evaporate to dryness on a water bath, dry at 103 to 105°C for 1 h, eool to balance temperature in an individual desiccator containing fresh desiccant, and weigh.

b) Solid samples—If the sample consists of discrete pieces of solid material (dewatered sludge, for example), take cores from each piece with a No. 7 oork borer or pulverize the entire sample coarsely on a clean surface by hand, using rubber gloves. Place 25 to 50 g in a prepared evaporating dish and weigh. Place in an oven at 103 to 105°C overnight. Cool to balance temperature in an individual desiccator containing fresh desiccant and weigh.

b. Fixed and volatile solids: Transfer to a cool mume furnace, heat furnace to 550 ± 50°C, and ignite for 1 h. (If the residue from 2) above contains large amounts of organic matter, first ignite the residue over a gas burner and under an exhaust hood in the presence of adequate air to lessen

losses due to reducing conditions and to avoid odors in the laboratory.) Cool in desicoator to balance temperature and weigh.

## 4. Calculation

% total solids = 
$$\frac{(A-B) \times 100}{C-B}$$

% volatile solids = 
$$\frac{(A-D) \times 100}{A-B}$$

% fixed solids = 
$$\frac{(D-B)\times 100}{A-B}$$

where

A = weight of dried residue + dish, mg.

B - weight of dish,

C = weight of wet sample + dish, mg, and

D = weight of residue + dish after ignition, mg.

## 5. Precision and Accuracy

Precision and accuracy data are not now available.

## 209 G. Reference

 SOKOLOFF, V.P. 1933. Water of erystallization in total solids of water analysis. Ind. Eng. Chem., Anal. Ed. 5:336.

## 209 H. Bibliography

THERIAULT, E.J. & H.H. WAGENBIALS. 1923. Studies of representative sewage plants. Pub. Heelth Bull. No. 132.

HOWARD, C.S. 1933. Determination of total dissolved solids in water analysis. Ind. Eng. Chem., Anal. Ed. 5:4.

SYMONS, C.E. & B. MORRY. 1941. The effect of

drying time on the determination of solids in sewage and sewage sludges. Sewage Works J. 13:936.

PISCHER, A.J. & G.S. SYMONS. 1944. The determination of settleable sewage solids by weight.

Weter Sewage Works 91:57.

DEGEN, J. & P.E. NUSSEEROER, 1956, Notes on